OPISTHORCHIASIS AND INTESTINAL FLUKE INFECTIONS IN NORTHERN THAILAND

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Abstract. Four hundred and thirty-one residents from 16 provinces in northern Thailand who had previously been found positive for *Opisthorchis viverrini* or *Opisthorchis viverrini*-like eggs were given praziquantel 40 mg/kg. The stool was collected for 4 to 6 times and examined for adult worms. The prevalence of *Opisthorchis viverrini* in this group was 11.6%. Intestinal flukes, *Haplorchis taichui* and *Haplorchis yokogawai*, were predominantly found in 63.11% and 10.44% respectively. Other intestinal flukes (*Centrocestus caninus, Echinostoma malayanum, Haplorchis pumilio, Phaneropsolus bonnei*, Plagiorchid flukes, *Prosthodendrium molenkampi* and *Stellantchasmus falcatus*) were also found in small numbers.

INTRODUCTION

Thailand is recognized as having a high prevalence of human liver fluke "*Opisthorchis viverrini*" infection (Khamboonruang, 1991). Intestinal flukes are regarded as of less public health importance than flukes inhabiting the liver or other vital organs, as many are asymptomatic. Because of the similarity of many trematode eggs, the diagnosis from fecal eggs tends to be given as the species of public health importance, or the same as previously reported species in the area (Waikagul, 1991). It is difficult to be certain of a diagnosis from fecal eggs, unless worms are recovered from stool specimens after treatment. Disfigurement might occur of treated worms which could lead to misidentification and the possibility of introducing a false new species. After praziquantel was introduced in Thailand as a treatment for opisthorchiasis it was discovered that the drug is also effective against intestinal flukes. The adult worms can be stained and identified after being expelled in the feces.

After a control program of Ministry of Public Health, Thailand to educate people to prevent foodborne parasitic zoonoses and mass treatment for opisthorchiasis in 1984, the prevalence of opisthorchiasis in northeastern Thailand has continuously declined from 78.7% in 1984 to 22.01% in 1992 (Ramasoota, 1991; Jongsuksantikul *et al*, 1992). In 1992, the prevalence of opisthorchiasis in the north (22.88%) was similar to the northeast (22.01%) (Jongsuksantikul *et al*, 1992). This caused Ministry of Public Health concern about the control program of opisthorchiasis in the north. However, before starting a control program like that in the northeast, the exact prevalence of opisthorchiasis in the north should be known. The objective of this study is to find the present prevalences of *Opisthorchis viverrini* and other intestinal fluke infections in northern Thailand.

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MATERIALS AND METHODS

Four hundred and thirty-one residents from 16 provinces (Nan, Phare, Uttaradit, Phitsanulok, Phetchabun, Phichit, Sukhothai, Kamphaeng Phet, Nakhon Sawan, Tak, Lampang, Phayao, Chiang Rai, Mae Hong Son, Lamphun, Chiang Mai) in northern Thailand previously found positive for *Opisthorchis viverrini* or *Opisthorchis viverrini*-like eggs were given praziquantel at a dose of 40 mg/kg body weight. Two hours later, saturated magnesium sulfate 30-45 ml was administered and stools were collected for 4-6 times.

All stools collected were washed and processed individually by sedimentation using the following method: normal saline solution was added to each stool specimen and stirred until all the fecal matter were homogeneously mixed. These were then poured into a 1 liter capacity sedimentation flask

and the undissolved matter allowed to settle for 30 minutes to 1 hour, after which the supernate was carefully poured off and discarded. This procedure was repeated until the supernate became clear. The remaining sediments were preserved in 10% formalin and transferred to the Hospital for Tropical Diseases for stereoscopic microscopic examination of the worms. Worms found were identified by gross morphology, except for the minute intestinal flukes which were stained with Semichon acetocarmine, counter-stained with fast green and mounted in Permount, and examined under the microscope for specific identification.

RESULTS

The total number of 431 subjected selected for this study were from 16 provinces in northern Thailand. Most of the subjects came from Phrae (30.39%), Nakhon Sawan (8.35%), Lampang (7.66%) and Phayao (7.19%). The prevalence of helminthic infections among the 431 subjects is shown in Table 1. Of 431 subjects, 82 ones (19.03%) had no parasite found on stool examination. The other 349 subjects (80.97%) had positive stool examinatons for parasites. Twelve species of worms were identified. Six helminth species frequently found in stools were *Haplorchis taichui* (63.11%), *Enterobius vermicularis* (22.27%), *Opisthorchis viverrini* (11.60%), *Haplorchis yokogawai* (10.44%), *Taenia* spp (4.87%), and *Haplorchis pumilio* (3.02%). One, two, three, four, five species were found in 130 (30.16%), 88 (20.42%), 19 (4.41%), 5 (1.16%) and 1 (0.23%) subjects respectively.

Table 1

Prevalences of helminthiasis from subjects positive by adult worm detection (n = 431).

Province (no. of subjects)	No. of subjects with positive stool examination for											
	Flukes										Other helminths	
	Cc	*Em*	*Hp*	*Ht*	*Hy*	*Ov*	*Pb*	*Pl*	*Pm*	*Sf*	*Ev*	*Ta*
Nan (n =11)	-	-	1	9	5	-	-	-	-	-	2	-
Phrae (n = 131)	-	-	6	110	6	14	-	-	1	-	22	5
Uttaradit (n = 16)	-	-	-	10	1	1	-	-	-	-	4	-
Phitsanulok (n = 9)	-	-	-	7	3	-	-	-	-	-	-	-
Phetchabun (n = 28)	-	1	-	6	1	1	2	-	2	-	3	-
Phichit (n = 16)	-	-	-	-	-	-	-	-	-	-	3	-
Sukhothai (n = 6)	-	-	-	2	-	1	-	-	-	-	2	-
Kamphaeng Phet (n = 22)	-	2	-	3	-		-	-	-	-	10	2
Nakhon Sawan (n = 36)	-	-	-	2	1	13	-	-	-	-	7	2
Tak (n = 9)	-	-	3	8	2	-	-	-	-	-	1	-
Lampang (n = 33)	-	-	4	30	2	1	-	-	-	-	15	3
Phayao (n = 31)	-	-	1	18	11	1	-	-	-	1	9	2
Chiang Rai (n = 22)	1	-	1	19	8	1	-	-	1	-	2	4
Mae Hong Son (n = 11)	-	-	-	11	-	-	-	2	-	-	2	-
Lamphun (n = 4)	-	-	-	3	-	1	-	-	-	-	-	-
Chaing Mai (n = 46)	1	-	2	34	5	11	-	-	-	-	14	3
Total (n = 431)	2	3	13	272	45	50	2	2	4	1	96	21
(%)	0.46	0.67	3.02	63.11	10.44	11.60	0.46	0.46	0.93	0.23	22.27	4.87

Cc = Centrocestus caninus, Em = Echinostoma malayanum, Hp = Haplorchis pumilio, Ht = Haplorchis taichui, Hy = Haplorchis yokogawai, Ov = Opisthorchis viverrini, Pb = Phaneropsolus bonnei, Pl = Plagiorchid fluke, *Pm = Prosthodendrium molenkampi, Sf = Stellantchasmus falcatus, Ev = Enterobius vermicularis, Ta = Taenia* spp.

DISCUSSION

Opisthorchiasis is still an important problem in Thailand. The habit of eating raw fish is the source of infection. The infection is found in young people and increases with age. Immigration of infected people from northeast to the north impacts on prevalences. The northerners acquire the infection from eating raw-fish dishes called "lahb-pla" and "plasom" (Kamboonruang, 1991). Jongsuksantigul *et al* (1992) reported the prevalence of infection in the north and northeast is 22.88% and 22.01%, respectively. The present infection in this study was lower than the previous report 5 years ago (11.60% *vs* 22.88%) (Jongsuksantigul *et al*, 1992). Decreasing prevalence of opisthorchiasis in the north may possibly be attributed to many factors, including better education about consuming raw food.

In the past, most intestinal flukes were found at autopsy or intestinal scraping during surgery (Manning *et al*, 1971). Definite species diagnosis could not be made by examinations of eggs, since the eggs of many trematode species look alike (Radomyos *et al*, 1984) and are unreliable for the definitive diagnosis of trematode infections. Therefore the prevalence of helminthiasis should be determined and confirmed by adult worm detection (Manning *et al*, 1971). Intestinal flukes are one of the most important food-borne parasitic zoonoses found in the north, northeast, and central regions of Thailand (Khamboonruang, 1991). Fourteen species have been reported. The distribution depends on the presence of the first and the second intermediate hosts and eating habits of the local people. After praziquantel administration, a purgative (magnesium sulfate) was given because the majority of worms recovered from stools without use of a purgative were found to be fragmented, but with purging most of the worms were complete, some dead and elongated, some still alive and contracting. Thus purging a few hours after praziquantel administration is recommended for worm identification (Radomyos *et al*, 1984).

In 1994, Radomyos *et al* reported the prevalence of intestinal flukes in 16 provinces in northeastern Thailand. Table 2 shows the comparative prevalence between northeasterners in 1994 and northerners in 1997. Northeasterners had higher

Table 2

Prevalences of flukes in northern and northeastern Thailand.

Parasite	Northerners[1] (n = 431)	Northeasterners[2] (n = 681)
Opisthorchis viverrini	50 (11.60%)	628 (92.2%)
Centrocestus caninus	2 (0.46%)	0 (0%)
Echinochamus japonicus	0 (0%)	1 (0.15%)
Echinostoma ilocanum	0 (0%)	51 (7.5%)
Echinostoma malayanum	3 (0.7%)	47 (6.9%)
Echinostoma revolutum	0 (0%)	4 (0.6%)
Episthmium caninum	0 (0%)	3 (0.4%)
Fasciolopsis buski	0 (0%)	1 (0.15%)
Haplorchis pumilio	13 (3.02%)	42 (6.2%)
Haplorchis taichui	272 (63.11%)	53 (7.8%)
Haplorchis yokogawai	45 (10.44%)	20 (2.9%)
Phaneropsolus bonnei	2 (0.46%)	102 (15.0%)
Plagiorchis harinasutai	0 (0%)	5 (0.7%)
Plagiorchid fluke	2 (0.46%)	0 (0%)
Prosthodendrium molenkampi	4 (0.93%)	132 (19.4%)
Stellantchasmus falcatus	1 (0.23%)	2 (0.3%)

[1]This study
[2]Radomyos *et al*, 1994

prevalence of *Echinostoma ilocanum* (7.5% *vs* 0%), *Echinostoma malayanum* (6.9% *vs* 0.7%), *Haplorchis pumilio* (6.2% *vs* 3.02%), *Phaneropsolus bonnei* (15.0% *vs* 0.46%) and *Prosthodendrium molenkampi* (19.4% *vs* 0.93%). Northerners had higher prevalence of *Haplorchis taichui* (63.11% *vs* 7.8%) and *Haplorchis yokogawai* (10.44% *vs* 2.9%). Prevalence of the other intestinal flukes was similar in the people of both regions.

Human infection with heterophyid flukes in Thailand is confined to the subfamily Haplorchinae. Five species of *Haplorchis (H. pumilio, H. taichui, H. yokogawai), Stellantchasmus falcatus* and *Centrocestus caninus* have been reported in Thailand (Radomyos *et al*, 1984, 1994; Waikagul, 1991; Waikagul *et al*, 1998). Fish serve as the second-intermediate host of the heterophyid flukes and many Thai people in the north eat raw fresh water fish. Two species of trematodes in the family Lecithodendriidae have been reported in Thailand. They are *Prosthodendrium molenkampi* and *Phaneropsolus bonnei*. Manning *et al* (1971) reported human cases of these species from northeastern Thailand. Infection is acquired by ingesting encysted metacercariae from dragon fly larvae (naiads) of the family Libeluidae. There are three species of *Plagiorchis (P. philippinensis, P. javensis*, and *P. harinasutai*) reported in man in Southeast Asia. *P. harinasutai* was a species found in man in Thailand (Radomyos *et al.* 1989). The genus *Plagiorchis* consists of a large number of species and differentiation between some of the species appears to be based on insignificant morphological characters, which makes the identification of plagiorchid a very difficult task (Lie, 1951). A source of infection of these species is believed to be fresh water snails that are similar to those serving a hosts for echinostomes. There are 6 species in family Echinostomatidae (*Echinostoma ilocanum, E. malayanum, E. revolutum, Echinochasmus japonicus, Epistmium caninum*, and *Hypoderaeum conoideum*) which have been reported in humans in Thailand. The parasites may be found in other parts of Southeast Asia; however *E. revolutum* has been reported only in Thailand and Indonesia. *Epistmium caninum* and *Hypoderaeum conoideum* have been reported only in Thailand (Radomyos, 1985; Harinasuta *et al*, 1987). Infections with flukes in the genera *Echinostoma* and *Hypoderaeum* are acquired by eating raw or undercooked snails, tadpoles or frogs containing encysted metacerariae. For *Epistmium*, the second intermediate host is fish. However, in this study, only *E. malayanum* was found. *E malayanum* and *E. ilocanum* are common species reported from several Southeast Asian countries (Waikagul, 1991).

In conclusion, our study shows that the prevalence of opisthorchiasis in northern Thailand is 11.6% which is lower than the study 5 years ago. Intestinal flukes were also found after praziquantel administration. A control program of Ministry of Public Health for opisthorchiasis in the north should be attempted. Eradication of intestinal flukes is a by-product of praziquantel treatment for opisthorchiasis.

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